

The Vertical and Dynamical Structure of the Great Red Spot as Determined by Galileo/NIMS

K. H. Baines, R. W. Carlson, G. S. Orton (JPL/CalTech), and the Galileo/NIMS Team

Multi-spectral imagery of Jupiter's Great Red Spot (GRS) acquired over three jovian rotations by the Galileo/NIMS are used to constrain the vertical aerosol structure and the windfield in and around this most- prominent of anti-cyclonic features. A wide range of atmospheric absorption strengths are covered by the 23 selected NIMS bandpasses, - which include weak, medium, and strong methane and hydrogen absorptions at 0.734, 0.898, 1.761, 2.042, 2.094, 2.168, and 2.375 μm - allowing NIMS to isolate in altitude prominent aspects of the GRS. The apparent size of the GRS varies markedly with bandpass, its linear dimensions shrinking to about 3/4 its visual size in moderate absorption wavelengths, indicating a bulk elliptical-"wedding cake" shape in its overall three-dimensional cloud structure. The GRS disappears at 2.375 μm , the strongest absorption bandpass, showing that the GRS is tropospheric. Along the eastern edge, a bright "leading edge" feature is observed on all three rotations, most prominent in all continuum bandpasses from 0.759 to 2.73 μm , indicative of a relatively low-lying yet optically-thick cloud. Its persistence is suggestive of formation by orographic uplift. The most-prominent continuum feature lies 4.5° to the west of the eastern edge, about midway to the center of the GRS. Preliminary analysis of this feature - utilizing a 2-cloud model with a particle-to-gas scale height of unity within the uppermost ammonia cloud - indicates a cloudtop near 260 mbar, and opacities of ~ 5.4 and 0.51 at 0.8 and $2.1 \mu\text{m}$, respectively, corresponding to a mean particle size for Mie scatterers of $0.375 \mu\text{m}$ and an ammonia mass column density of $\sim 70 \mu\text{g}/\text{cm}^2$. With the same aerosol number density, the cloudtop of the "leading edge" feature is ~ 60 mbars (~ 3 km) deeper. Just outside the GRS, the same model yields a cloudtop ~ 3 km deeper still, i.e., near 380 mbar.

Abstract submitted for 1996 DPS meeting

Date submitted: LPI electronic form version 5/96

Division for Planetary Sciences Abstract Form

DPS Category 15

Running #7488

Session 0.00

Invited ☐ Poster presentation ☒ Title only ☐

Have you received your Ph.D. since the last DPS meeting?

Yes ☐ No ☐

Is your abstract newsworthy, and if so, would you be willing to prepare a news release and be available for interviews with reporters?

Yes ☐ No ☐ Maybe ☒

Paper presented by Kevin H Baines

JPL
M/S 183-601
4800 Oak Grove Drive
Pasadena CA 91109 USA
Phone: 818-354-0481
Fax: 818-393-4605
Email: kbaines@aloha.jpl.nasa.gov

Special instructions: Tue Aug 27 16:58:49 CDT 1996

Membership Status (First Author):

DPS-AAS Member ☒ Non-Member ☐

Student Member ☐ Student Non-Member ☐

Is this your first DPS presentation? Yes ☐ No ☐

Sponsor: